



BOTSWANA EXAMINATIONS COUNCIL
JUNIOR CERTIFICATE EXAMINATION

SCIENCE

14/2

Paper 2

October/November 2023

Marks: 80

Time: 2 Hours

Candidate
Full Names:

Centre Number:

J	C				
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Candidate Number:

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INSTRUCTIONS

1. Write your full names and examination number in the spaces provided above.
2. Answer **ALL** questions.
3. All answers must be written in the spaces provided.
4. Show **ALL** the necessary working.
5. Calculators may be used in this paper.
6. A copy of the Periodic Table is printed on page 20.

FOR EXAMINER'S USE ONLY

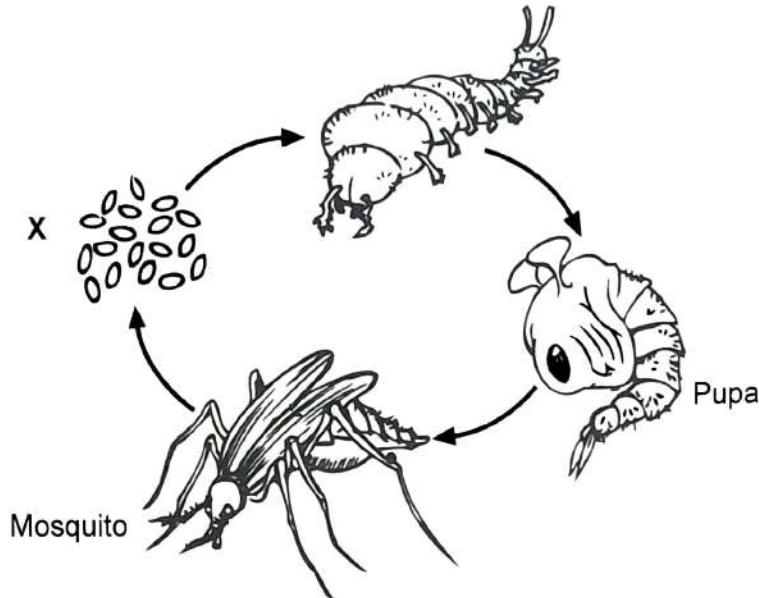
Section	Marks Scored
A	
B	
Total Marks	

This question paper contains 19 printed pages and 1 blank page.

SECTION A

(60 Marks)

The diagram below shows the life cycle of a mosquito. Use it to answer question 1.



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1. (a) Name stage X.

..... (1)

(b) Suggest **one** way in which the disease spread by mosquito can be prevented.

.....
..... (1)

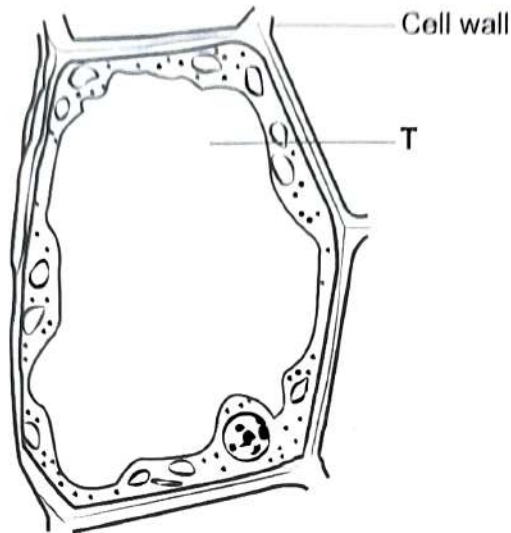
(c) State **one** way in which the pupa of the mosquito is adapted for living in water.

.....
..... (1)

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The diagram below shows a cell of an onion observed under a microscope with one of the parts labeled T. Use it to answer question 2.



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2 (a) What is the advantage of using the microscope?

.....
..... (1)

(b) State **two** functions of structure T.

.....
..... (2)

(c) Label with letter X the part that controls the activities within a cell.

(1)

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3. (a) Describe **two** changes that will occur in a flower after fertilisation.

.....
 (2)

(b) State the role of petals in a flower.

..... (1)

Students carried out food tests on three food substances W, X and Y. The results of the tests are given in the table below. Use it to answer question 4.

Food substance	Test result			
	Starch	Glucose	Protein	Fat
W	Present	Absent	Absent	Absent
X	Absent	Absent	Present	Present
Y	Present	Absent	Present	Present

4. (a) State the food substance which is likely to be:

(i) meat,
 (1)

(ii) maize meal.
 (1)

(b) Describe how food substance Y was tested for fat.

.....

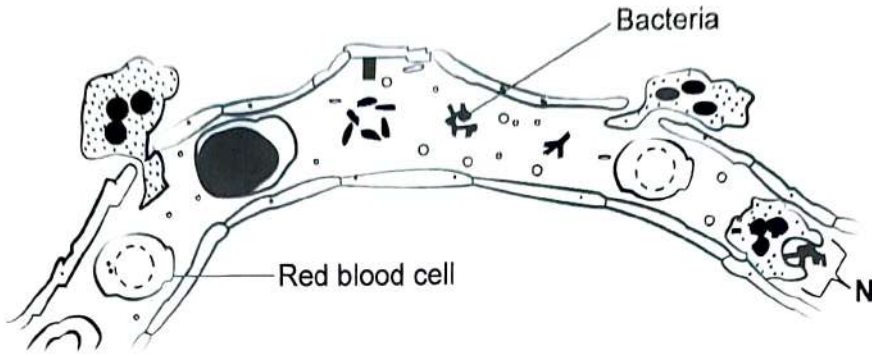
 (3)

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The diagram below shows a section of a blood vessel with some contents labeled. Use it to answer question 5.



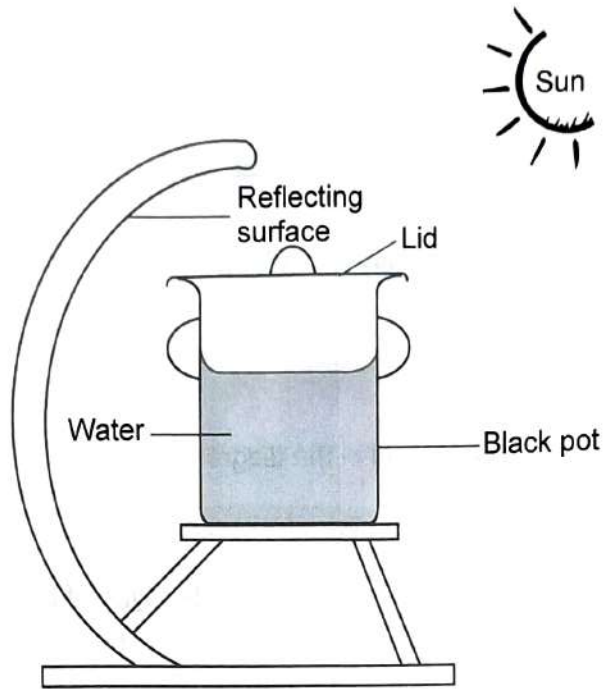
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5. (a) Name the type of blood vessel in the diagram.
..... (1)
- (b) State **two** features that are characteristic of the type of blood vessel in the diagram.
.....
..... (2)
- (c) Explain what is happening to the bacteria in the diagram at N.
.....
..... (2)
-

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The diagram below shows a solar cooker being used to warm water.
Use it to answer question 6.



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6. (a) (i) Name the heat transfer method by which solar energy from the sun travels to the solar cooker on earth.
..... (1)
- (ii) Explain how it is helpful that the pot is made black in colour.
.....
..... (1)
- (iii) Suggest a suitable colour for the reflecting surface.
..... (1)
- (iv) Explain why it is important for the pot to be covered with a lid when the water is heated.
.....
..... (2)

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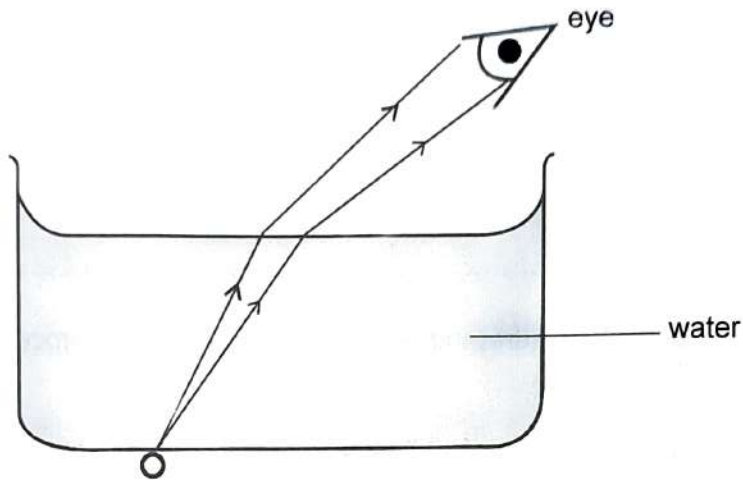


(b) Give one advantage of using solar energy instead of firewood to heat the water.

.....
.....

(1)

The diagram below shows two light rays from a bulb at point, O, at the base of a pool entering an observer's eye above the water. Use it to answer question 7 (a).



7. (a) (i) Draw dashed lines (---) on the diagram to locate a point, I, where the observer will see the image of the bulb. (2)

(ii) Name the process that causes the rays to change direction at the water surface.

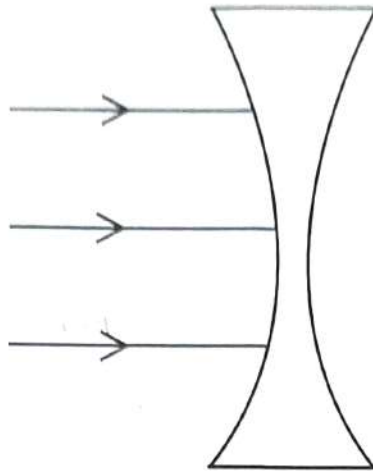
..... (1)

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(b) The diagram below shows a parallel beam of light incident on a lens.



(i) Name the type of lens shown.

..... (1)

(ii) Continue by drawing the rays to show how they proceed after reaching the lens. (1)

(iii) Name the eye defect that is corrected using the type of lens shown above.

..... (1)

8. (a) State the principle of moment of a force.

.....

..... (1)

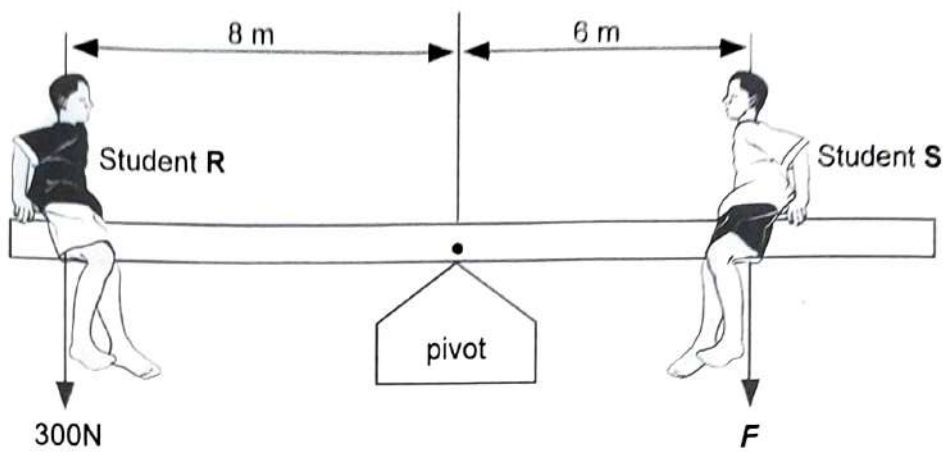
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- (b) Student **R** and Student **S** sit on a uniform beam pivoted at the centre as shown below.

Student **R** weighs 300N and Student **S** has a weight of F .



The beam is balanced horizontally.

- (i) Calculate the moment of Student **R**'s weight about the pivot.

Moment = (3)

- (ii) Calculate the Student **S**'s weight, F .

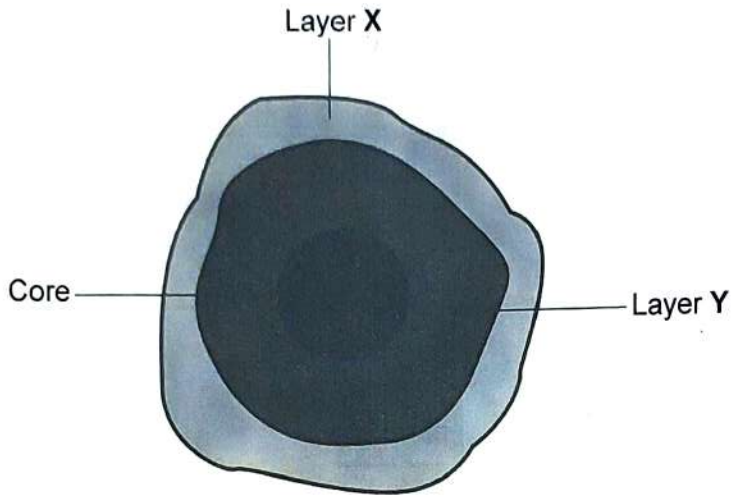
$F =$ N (2)

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The diagram below shows a cross-section of the earth with some layers labelled X and Y. Use it to answer question 9.



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9. (a) Name layer X.

..... (1)

(b) Write down the state of matter of layer Y.

..... (1)

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10. (a) Define radioactivity.

.....
..... (1)

(b) State **one** danger of exposure to radioactive sources.

.....
..... (1)

(c) State **two** safety measures when handling radioactive sources in a laboratory.

.....
.....
.....
..... (2)

(d) Suggest **one** advantage of generating electricity using radioactive substances.

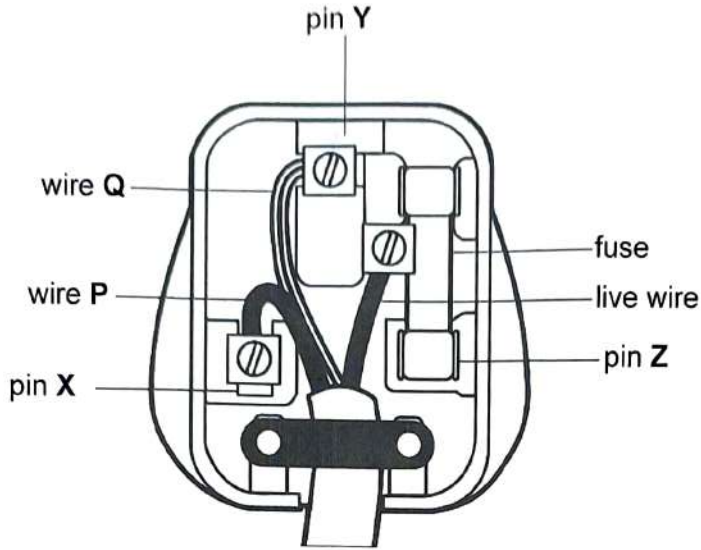
.....
..... (1)

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The diagram below shows a 3 pin-plug that is used for connecting appliances to the mains electricity socket. Use it to answer question 11.



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11. (a) (i) Pin Z is the *live* pin. Complete the table below by naming pin X and pin Y.

Pin	X	Y	Z
Name			<i>live</i>

(2)

- (ii) The fuse has a rating of 13A. Explain what a “fuse rating of 13A” means.

.....
 (1)

- (b) (i) State the colour of the insulating plastic of wire P.

..... (1)

- (ii) Explain why the fuse is connected to the live wire.

.....
 (2)

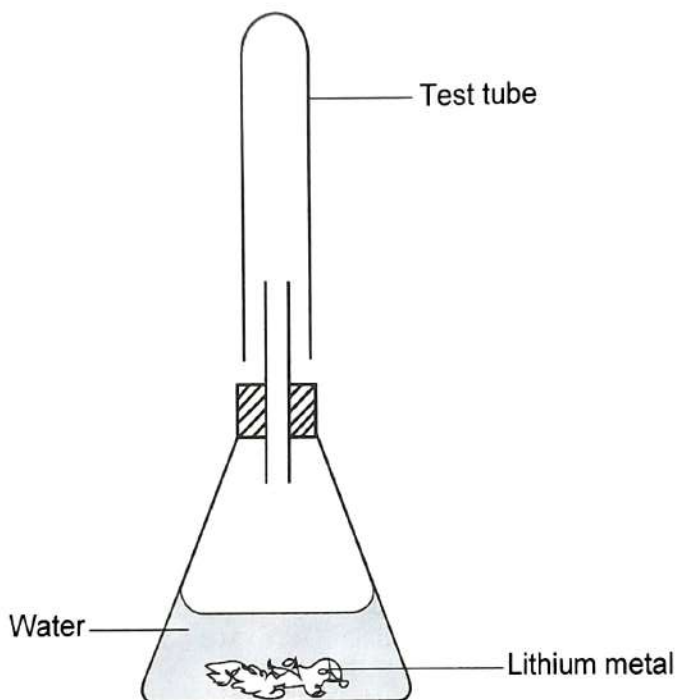
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- (c) Some appliances are fitted with a two-pin plug.
Identify the wire that is missing from the two-pin plug.

..... (1)

The diagram below shows a set-up that was used to investigate some properties of a gas produced when Lithium metal reacts with water. Use it to answer question 12.



12. (a) Explain why it is possible to collect the gas produced as shown above.

.....
..... (2)

- (b) State any **two** observations that will be made during the reaction.

.....
..... (2)

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(c) Describe the test for the gas produced.

Test:

Result: (2)

(d) State any **two** physical properties of lithium.

.....

..... (2)

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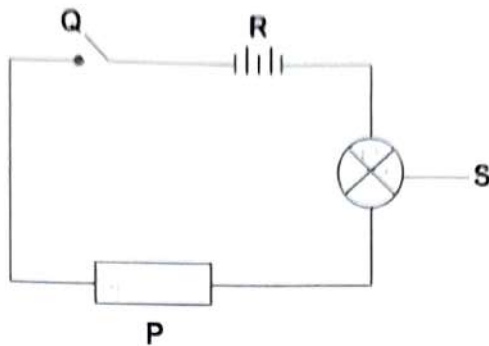
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SECTION B

(20 Marks)

The diagram below shows an electric circuit with components labeled P, Q, R and S. Use it to answer question 13.



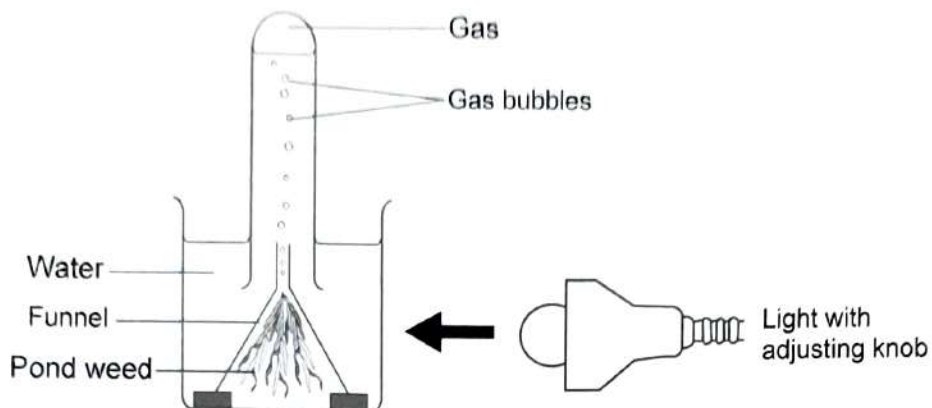
13. (a) State the function of component P. (1)
-
- (b) Show by drawing on the diagram how you will connect the voltmeter to measure the potential difference across S. (1)
- (c) Explain how the components of the circuit can be rearranged to obtain a **larger** current in the circuit. (1)
-
-
- (d) When the switch Q was closed, the potential difference across S was measured to be 6 V. The resistance of S was found to be 15 Ω.
- Calculate the current flowing through the circuit.

Current = A (2)



14. The diagram below shows a set-up used to investigate the effect of light intensity on the rate of photosynthesis. The light intensity was controlled by adjusting the power supplied to the bulb.

A Pond weed was placed inside the beaker and gas bubbles were released and collected as shown. The rate of photosynthesis was measured by counting the number of gas bubbles released per minute.



The table below shows the results of the investigation:

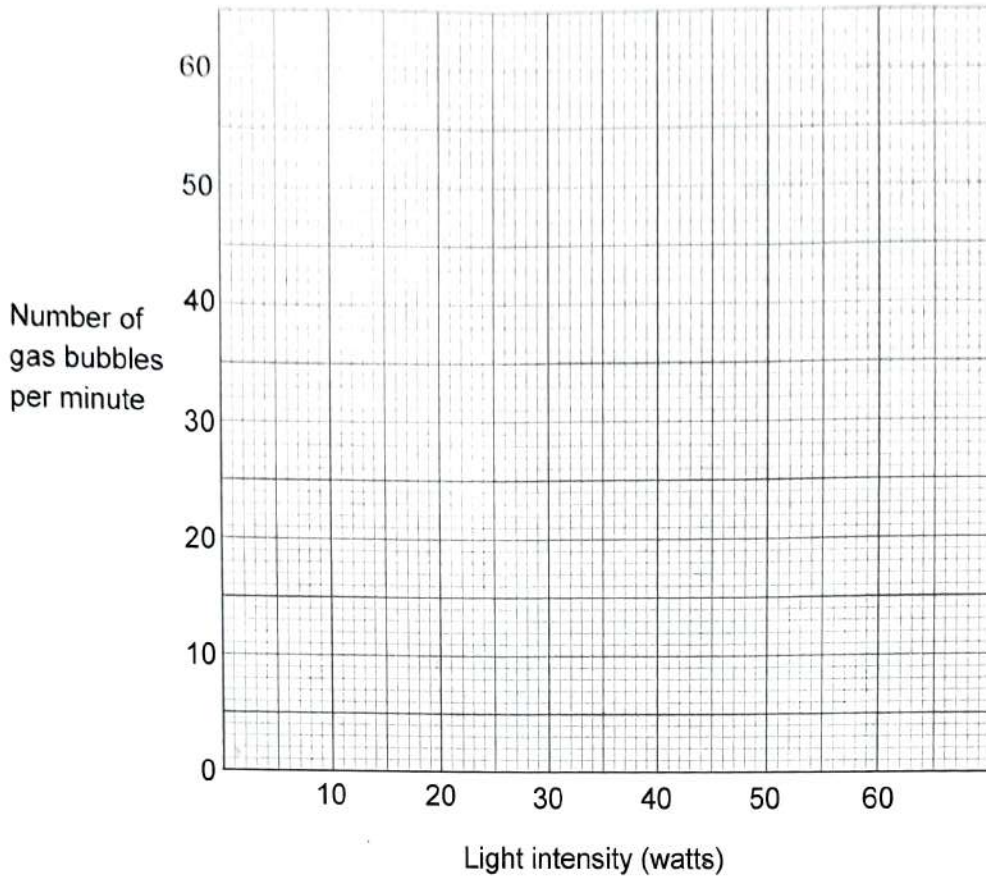
Light intensity (watts)	0	3	10	16	25	30	35	40
No. of gas bubbles released / min	0	7	20	31	43	47	50	50

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- (a) Plot a graph of the number of gas bubbles released per minute against the light intensity on the grid below. The axes have been labeled for you. (4)



- (b) Using your graph, determine the number of bubbles released per minute by a light intensity of 20 watts. Show your working.

Number of bubbles = per minute (2)

- (c) Name the gas collected during the investigation.
..... (1)

- (d) Explain the observation made from the light intensity of 35 to 40 watts.
.....
.....
..... (2)

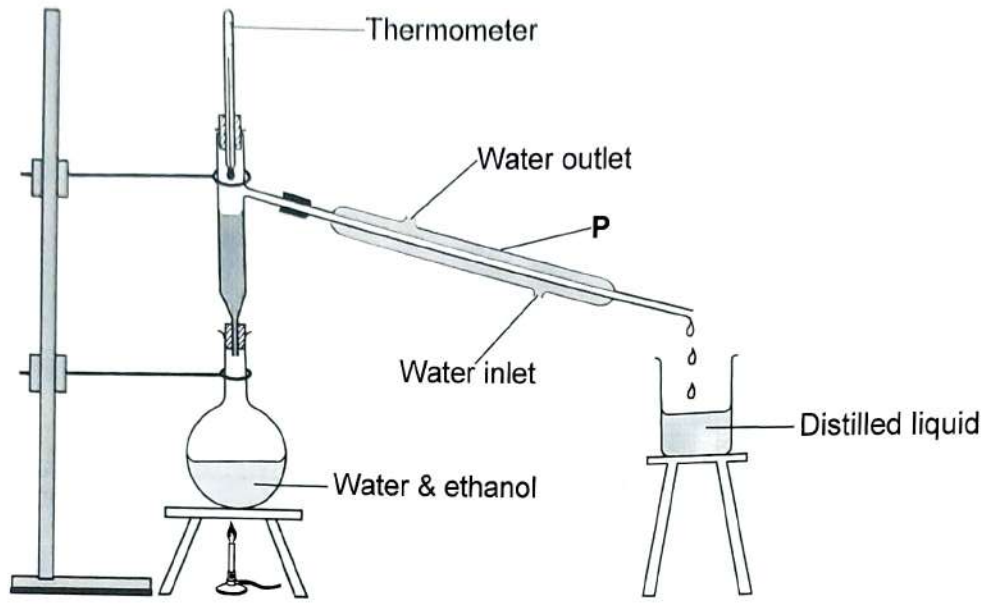


(e) Write down the conclusion that could be made from the investigation.

.....
..... (1)

The diagram below shows a set-up used by a student to separate a mixture of water and ethanol. One of the apparatus used is labeled P. Use it to answer question 15.

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15. (a) Name the separation technique shown by the diagram.

..... (1)

(b) Name the apparatus labeled P.

..... (1)

(c) State any **one** physical property of pure water.

.....
..... (1)

(d) Describe the chemical test for water.

Test:

Result: (2)

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DATA SHEET
The Periodic Table of the Elements

		Group															
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII						
1 H Hydrogen																	
3 Li Lithium	4 Be Beryllium																
11 Na Sodium	12 Mg Magnesium																
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon
55 Cs Caesium	56 Ba Barium	57 La Lanthanum	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon
87 Fr Francium	88 Ra Radium	89 Ac Actinium															

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a	X
b	

 a = relative atomic mass
 X = atomic symbol
 b = proton (atomic) number

140 Ce Cerium	141 Pr Praseodymium	144 Nd Neodymium	150 Sm Samarium	152 Eu Europium	157 Gd Gadolinium	159 Tb Terbium	162 Dy Dysprosium	165 Ho Holmium	167 Er Erbium	168 Tm Thulium	173 Yb Ytterbium	175 Lu Lutetium
58	59	60	62	63	64	65	66	67	68	69	70	71
90 Th Thorium	91 Pa Protactinium	92 U Uranium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).